

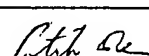
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PTO/SB/05 (01-04)

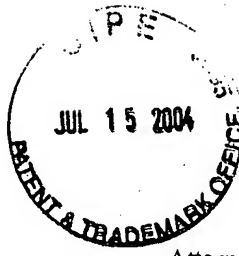
# UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	019930-002510US
First Inventor	Bevan Staple
Title	MEMS-BASED NONCONTACTING FREE-SPACE OPTICAL SWITCH
Express Mail Label No.	EV 325768123 US

APPLICATION ELEMENTS		ADDRESS TO	
See MPEP chapter 600 concerning utility patent application contents.		Mail Stop Patent Application Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450	
<p>1. <input checked="" type="checkbox"/> Fee Transmittal Form (e.g., PTO/SB/17) (Submit an original and a duplicate for fee processing)</p> <p>2. <input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27.</p> <p>3. <input checked="" type="checkbox"/> Specification (from parent) [Total Pages 22 ] (preferred arrangement set forth below)</p> <ul style="list-style-type: none"> <li>- Descriptive title of the invention</li> <li>- Cross Reference to Related Applications</li> <li>- Statement Regarding Fed sponsored R &amp; D</li> <li>- Reference to sequence listing, a table, or a computer program listing appendix</li> <li>- Background of the invention</li> <li>- Brief Summary of the invention</li> <li>- Brief Description of the Drawings (if filed)</li> <li>- Detailed Description</li> <li>- Claim(s)</li> <li>- Abstract of the Disclosure</li> </ul> <p>4. <input checked="" type="checkbox"/> Drawing(s) (from parent) [Total Sheets 14 ]</p> <p>5. Oath or Declaration [Total Pages 1 ]</p> <p>a. <input type="checkbox"/> Newly executed (original or copy)</p> <p>b. <input checked="" type="checkbox"/> Copy from a prior application (37 CFR 1.63 (d)) (for a continuation/divisional with Box 18 completed)</p> <p>i. <input type="checkbox"/> <b>DELETION OF INVENTOR(S)</b> Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).</p> <p>6. <input checked="" type="checkbox"/> Application Data Sheet. See 37 CFR 1.76</p>		<p>7. <input type="checkbox"/> CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix)</p> <p>8. Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary)</p> <p>a. <input type="checkbox"/> Computer Readable Form (CRF)</p> <p>b. Specification Sequence Listing on:</p> <p>i. <input type="checkbox"/> CD-ROM or CD-R (2 copies); or</p> <p>ii. <input type="checkbox"/> Paper number of pages</p> <p>c. <input type="checkbox"/> Statements verifying identity of above copies</p>	
		<h3>ACCOMPANYING APPLICATIONS PARTS</h3> <p>9. <input checked="" type="checkbox"/> Assignment Papers (from parent)</p> <p>10. <input checked="" type="checkbox"/> 37 CFR 3.73(b) Statement (from parent) <input checked="" type="checkbox"/> Power of Attorney (from parent)</p> <p>11. <input type="checkbox"/> English Translation Document (if applicable)</p> <p>12. <input type="checkbox"/> Information Disclosure Statement (IDS)/PTO-1449 <input type="checkbox"/> Copies of IDS Citations</p> <p>13. <input checked="" type="checkbox"/> Preliminary Amendment</p> <p>14. <input checked="" type="checkbox"/> Return Receipt Postcard (MPEP 503) (Should be specifically itemized)</p> <p>15. <input type="checkbox"/> Certified Copy of Priority Document(s) (if foreign priority is claimed)</p> <p>16. <input type="checkbox"/> Nonpublication Request under 35 U.S.C. 122 (b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent</p> <p>17. <input type="checkbox"/> Other:</p>	
<p>18. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:</p> <p><input checked="" type="checkbox"/> Continuation <input type="checkbox"/> Divisional <input type="checkbox"/> Continuation-in-part (CIP) of prior application No: <u>09/899,002</u></p> <p>Prior application information: Examiner <u>Michelle R. Connelly Cushwa</u> Art Unit: <u>2874</u></p> <p>For CONTINUATION OF DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.</p>			
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Attorney Docket No.: 019930-002510US  
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By: Kira L. McNeil

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re application of:

Bevan Staple, et al.

Application No.: Not yet assigned

Filed: Herewith

For: MEMS-BASED  
NONCONTACTING FREE-SPACE  
OPTICAL SWITCH

Customer No.: 20350

Examiner: Not yet assigned

Technology Center/Art Unit: Not yet  
assigned

PRELIMINARY AMENDMENT

Mail Stop Patent Application  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Prior to examination of the above-referenced application, please enter the following amendments and remarks:

**Amendments to the Specification** begin on page 2 of this paper.

**Amendments to the Abstract** begin on page 4 of this paper.

**Amendments to the Claims** are reflected in the listing of claims which begins on page 5 of this paper.

**Remarks** begin on page 10 of this paper.

**COPY**

Amendments to the Specification:

Please amend the title of the application as follows:

MOVABLE MEMS-BASED NONCONTACTING ~~FREE SPACE OPTICAL SWITCH~~  
DEVICE

Please amend the paragraph at p. 1, ll. 5 – 12 as follows:

This application is a continuation of U.S. Pat. Appl. No. 09/899,002, entitled  
“MEMS-BASED NONCONTACTING FREE-SPACE OPTICAL SWITCH,” filed July 3, 2001,  
the entire disclosure of which is incorporated herein by reference for all purposes. This  
application is ~~being filed concurrently with related U.S. Patent Applications~~ also related to:  
U.S. Pat. No. 6,657,759, entitled “BISTABLE MICROMIRROR WITH CONTACTLESS  
STOPS” filed July 3, 2001 by Lilac Muller, ~~Attorney Docket Number 19930-003200~~; U.S. Pat.  
No. 6,614,581, entitled “METHODS AND APPARATUS FOR PROVIDING A MULTI-STOP  
MICROMIRROR,” filed July 3, 2001 by David Paul Anderson, ~~Attorney Docket Number~~  
~~19930-003000~~; and U.S. Pat. No. 6,625,342, entitled “SYSTEMS AND METHODS FOR  
OVERCOMING STICTION USING A LEVER,” filed July 3, 2001 by Bevan Staple, David  
Paul Anderson, and Lilac Muller, ~~Attorney Docket Number 19930-003100~~; all of which are  
herein incorporated by reference in its entirety for all purposes.

Please amend the paragraph at p. 12, ll. 11 – 21 as follows:

Tilting micromirrors according to the embodiments described above, and their  
equivalents, may be used in numerous applications as parts of optical switches, display devices,  
or signal modulators, among others. One particular application of such tilting micromirrors is as  
optical switches in a wavelength router such as may be used in fiber-optic telecommunications

systems. One such wavelength router is described in detail in the copending, commonly assigned ~~United States Patent Application~~ U.S. Pat. No. 6,501,877, filed November 16, 1999 ~~and assigned Serial No. 09/442,061~~, entitled "Wavelength Router," which is herein incorporated by reference in its entirety, including the Appendix, for all purposes. The various micromirror embodiments may be used in that wavelength router or may be incorporated into other wavelength routers as optical switches where it is desirable to avoid stiction problems.

**Amendments to the Abstract:**

Please amend the Abstract of the Disclosure as follows:

A movable microstructure ~~for steering light~~ that mitigates stiction problems is provided. A first tiltable assembly ~~that includes a reflective coating~~ is ~~connected with~~ formed over a substrate. A second tiltable assembly is also ~~connected with~~ formed over the substrate. First and second electrodes are ~~connected with~~ positioned relative to the substrate ~~and are configured~~ to tilt the two tiltable assemblies such that they are interdigitated. In various embodiments, the tiltable assemblies are configured as cantilever arrangements and/or torsion-beam arrangements.

Amendments to the Claims:

Please cancel Claims 5, 14, 21, and 27 – 29, and amend Claims 1, 6, 10, 15 – 17, and 23 as indicated in the following listing of claims, which replaces all prior versions and listings of claims in the application.

Listing of Claims:

1. (Currently Amended) A movable microstructure ~~for steering light, the~~  
~~microstructure~~ comprising:
  - ~~a substrate;~~
  - a first tiltable assembly ~~connected with the~~ formed over a substrate, ~~the first~~  
~~tiltable assembly including a reflective coating;~~
  - a second tiltable assembly ~~connected with~~ formed over the substrate; and
  - first and second electrodes ~~connected with the substrate and~~ respectively  
configured positioned relative to the substrate to tilt the first and second tiltable assemblies upon  
activation such that the first and second tiltable assemblies are interdigitated.
2. (Original) The microstructure recited in claim 1 wherein the first tiltable  
assembly is configured as a cantilever arrangement.
3. (Original) The microstructure recited in claim 2 wherein the second tiltable  
assembly is configured as a torsion-beam arrangement.
4. (Original) The microstructure recited in claim 1 wherein the second tiltable  
assembly is configured as a torsion-beam arrangement.
5. (Canceled).

6. (Currently Amended) The microstructure recited in claim 1,  
wherein the first tiltable assembly includes:

a first structural linkage ~~connected with~~ formed over the substrate;

a first structural film supported by the first structural linkage and having a plurality of fingers at an end of the first structural film, ~~with the reflective coating on the first structural film~~; and

wherein the second tiltable assembly includes:

a second structural linkage ~~connected with~~ formed over the substrate; and

a second structural film supported by the second structural linkage and having a plurality of fingers at an end of the second structural film.

7. (Original) The microstructure recited in claim 6 wherein the first and second electrodes comprise polysilicon.

8. (Original) The microstructure recited in claim 6 wherein the first and second structural films comprise polysilicon.

9. (Original) The microstructure recited in claim 6 wherein the first structural linkage has a greater height above the substrate than the second structural linkage.

10. (Currently Amended) A method for fabricating a movable microstructure ~~for steering light~~, the method comprising:

forming a first tiltable assembly ~~on~~ over a substrate, ~~the first tiltable assembly including a reflective coating~~;

forming a second tiltable assembly ~~on~~ over the substrate; and

forming first and second electrodes ~~on the substrate, such first and second electrodes being configured~~ relative to the substrate to tilt the first and second tiltable assemblies upon activation such that the first and second tiltable assemblies interdigitate.

11. (Original) The method recited in claim 10 wherein forming the first tiltable assembly comprises creating a cantilever arrangement.

12. (Original) The method recited in claim 11 wherein forming the second tiltable assembly comprises creating a torsion-beam arrangement.

13. (Original) The method recited in claim 10 wherein forming the second tiltable assembly comprises creating a torsion-beam arrangement.

14. (Canceled).

15. (Currently Amended) The method recited in claim 10,  
wherein forming the first tiltable assembly includes:

forming a first structural linkage ~~on~~ over the substrate;

forming a first structural film on the first structural linkage, the first structural film having a plurality of fingers at an end of the first structural film, ~~with the reflective coating deposited on the first structural film;~~ and

wherein forming the second tiltable assembly includes:

forming a second structural linkage ~~on~~ over the substrate; and

forming a second structural film on the second structural linkage, the second structural film having a plurality of fingers at an end of the second structural film.

16. (Currently Amended) The method recited in claim 15 wherein forming the first structural linkage comprises forming the first structural linkage ~~on~~ over the substrate at a height greater than the second structural linkage.

17. (Currently Amended) A method for operating ~~an optical switch~~ a movable microstructure, the method comprising:



tilting a first assembly by applying a first electrostatic force, the first assembly including:

a first structural linkage ~~connected with~~ formed over a substrate; and  
a first structural film supported by the first structural linkage and having a plurality of fingers at an end of the first structural film; ~~and~~

~~a reflective coating on the first structural film;~~

tilting a second assembly by applying a second electrostatic force, the second assembly including:

a second structural linkage ~~connected with~~ formed over the substrate; and  
a second structural film supported by the second structural linkage and having a plurality of fingers at an end of the second structural film; and

holding the first and second assemblies electrostatically in a fixed position with the fingers of the first and second structural films interdigitated.

18. (Original) The method recited in claim 17 wherein the first assembly is configured as a cantilever arrangement.

19. (Original) The method recited in claim 18 wherein the second assembly is configured as a torsion-beam arrangement.

20. (Original) The method recited in claim 17 wherein the second assembly is configured as a torsion-beam arrangement.

21. (Canceled).

22. (Original) The method recited in claim 17 wherein tilting the first assembly comprises tilting the end of the first structural film having a plurality of fingers towards the substrate and tilting the second assembly comprises tilting the end of the second structural film having a plurality of fingers away from the structural assembly.

23. (Currently Amended) A movable microstructure ~~for steering light~~, the microstructure comprising:  
~~support means;~~  
tiltable micromirror means ~~connected with the~~ formed over a support means;  
tiltable snare means connected with the support means; and  
means for generating electrostatic forces for tilting the tiltable micromirror means and the tiltable snare means into an interdigitated configuration.

24. (Original) The microstructure recited in claim 23 wherein the tiltable micromirror means comprises cantilever means.

25. (Original) The microstructure recited in claim 28 wherein the snare means comprises torsion-beam means.

26. (Original) The microstructure recited in claim 23 wherein the micromirror means comprises torsion-beam means.

27. – 29. (Canceled).

REMARKS

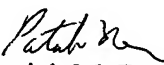
The claims have been amended, and examination of the amended claims is respectfully requested. Amendments have been made to the title and abstract for consistency with the claim amendments. The specification has been amended to provide updated information for certain cited patents.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 303-571-4000.

Respectfully submitted,

  
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Reg. No. 44,037

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